

CLAIMS

We claim:

- 5 1. A method to provide for evaluating expressions, comprising:
 receiving code for a program, said code includes one or more expressions and one
 or more markers that specify when said one or more expressions should be evaluated
 during execution of said program; and
 automatically providing additional functionality to said code for said program,
10 said additional functionality evaluates said one or more expressions during execution of
 said program at one or more times specified by said one or more markers.
2. A method according to claim 1, wherein:
 said one or more markers specify when said one or more expressions should be
15 evaluated during execution of said program independent from a context of where said
 expressions are used.
3. A method according to claim 1, wherein:
 said markers can indicate that a particular expression should be evaluated
20 immediately, once or always.
4. A method according to claim 3, wherein:
 failure of a marker to indicate that a particular expression should be evaluated
 immediately or once defaults to an indication indicate that said particular expression
25 should be evaluated always.
5. A method according to claim 1, wherein:

said one or more expressions are constraints for variables; and
said step of automatically providing additional functionality to said code includes adding codes that creates an object for each constraint, adds functions to said object that sets said variables, and adds functions that sets dependencies for said expressions.

5

6. A method according to claim 1, wherein:
said code for said program is XML code.

7. A method according to claim 1, wherein:
10 said step of automatically providing additional functionality to said code includes compiling said code.

8. A method according to claim 1, further comprising:
receiving a request for content via a network;
15 transmitting said code with said additional functionality to a client via said network; and
executing said code with said additional functionality at said client.

9. One or more processor readable storage devices having processor readable
20 code embodied on said processor readable storage devices, said processor readable code for programming one or more processors to perform a method to provide for evaluating expressions, said method comprising:
accessing code for a program, said code includes one or more expressions and one
or more markers that specify when said one or more expressions should be evaluated
25 during execution of said program; and
automatically providing for an evaluation of said one or more expressions during execution of said program at one or more times specified by said one or more markers.

10. One or more processor readable storage devices according to claim 9,
wherein:

said one or more markers specify when said one or more expressions should be
5 evaluated during execution of said program independent from a context of where said
expressions are used.

11. One or more processor readable storage devices according to claim 9,
wherein:

10 said markers can indicate that a particular expression should be evaluated
immediately, once or always.

12. One or more processor readable storage devices according to claim 9,
wherein:

15 said step of automatically providing for an evaluation includes compiling said
code.

13. A method to provide for evaluating expressions, comprising:
receiving code for a program, said code includes one or more expressions and one
20 or more markers that specify when said one or more expressions should be evaluated
during execution of said program; and
evaluating said one or more expressions during execution of said program at times
specified by said one or more markers.

25 14. A method according to claim 13, wherein:
said one or more markers specify when said one or more expressions should be
evaluated during execution of said program independent from a context of where said

expressions are used.

15. A method according to claim 13, wherein:
said markers can indicate that a particular expression should be evaluated
5 immediately, once or always.

16. A method according to claim 13, wherein:
said code for said program is XML source code.

10 17. A method according to claim 13, wherein:
said code for said program is object code.

18. A method to provide for evaluating expressions, comprising:
accessing code that includes an expression defining a first variable, said
15 expression is dependent on a changeable item; and
compiling said code, said step of compiling said code adds additional
functionality to said code, said additional functionality evaluates said expression when
said item changes and updates said first variable.

20 19. A method according to claim 18, wherein:
said expression is part of a constraint for said first variable;
said step of compiling includes creating an object for said constraint, adding a
first function to said object that sets said first variable, determining dependency of said
expression and adding a second function for said dependency.

25 20. A method according to claim 19, wherein:
said additional functionality includes code that adds said first function to an object

for said first variable and code that provides a pointer to said first function to an object for said changeable item to be called by said object for said changeable item when said changeable item changes.

5 21. A method according to claim 18, wherein:
 said code includes a marker for said expression, said marker specifies when said expression should be evaluated during execution of said code.

 22. One or more processor readable storage devices having processor readable
10 code embodied on said processor readable storage devices, said processor readable code for programming one or more processors to perform a method to provide for evaluation of expressions, said processor readable code comprising:

 preexisting functionality that evaluates expressions when a dependency changes and updates a variable based on said expression;

15 code that accesses first code, said first code includes a first expression defining a first variable, said first expression is dependent on a first dependency; and

 code that combines said preexisting functionality with said first code so that when said first code is executed said first variable is updated by said first expression when said first dependency changes.

20

 23. A method according to claim 22, wherein:

 said first expression is part of a constraint for said first variable; and

 said code that combines said preexisting functionality with said first code creates an object for said constraint, adds a first function to said object that sets said first
25 variable, determines dependency of said first expression and adds a second function for said dependency to said object.

24. A method according to claim 22, wherein:
said preexisting functionality includes code that adds said first function to an
object for said first variable and code that provides a pointer to said first function to an
object for said first dependency to be called by said object for said first dependency when
5 said first dependency changes.

25. A method according to claim 22, wherein:
said first code includes a marker for said first expression, said marker specifies
when said first expression should be evaluated during execution of said first code.
10

26. A method to provide for evaluating expressions, comprising:
receiving code that includes an expression defining a first variable, said
expression is dependent on a changeable item; and
automatically providing additional functionality to said code, said additional
15 functionality evaluates said expression when said item changes and updates said first
variable.

27. A method according to claim 26, wherein:
said expression is part of a constraint for said first variable; and
20 said step of automatically providing includes creating an object for said
constraint, adding a first function to said object that sets said first variable, determining
dependency of said expression and adding a second function for said dependency to said
object.

28. A method according to claim 27, wherein:
said additional functionality includes code that adds said first function to an object
for said first variable and code that provides a pointer to said first function to an object
25

for said changeable item to be called by said object for said changeable item when said changeable item changes.

29. A method according to claim 26, wherein:

5 said code includes a marker for said expression, said marker specifies when said expression should be evaluated during execution of said code.

30. A method according to claim 26, further comprising:

requesting said code by an Internet client;
10 transmitting said code with said additional functionality to said Internet client after said step of automatically providing; and
executing said code with said additional functionality using said Internet client.

31. One or more processor readable storage devices having processor readable

15 code embodied on said processor readable storage devices, said processor readable code for programming one or more processors to perform a method to provide for evaluating expressions, said method comprising:

accessing code that includes an expression defining a first variable, said expression is dependent on a changeable item; and

20 automatically providing preexisting additional functionality to said code, said preexisting additional functionality evaluates said expression when said item changes and updates said first variable.

32. One or more processor readable storage devices according to claim 31,

25 wherein:

said expression is part of a constraint for said first variable; and

said step of automatically providing includes creating an object for said

constraint, adding a first function to said object that sets said first variable, determining dependency of said expression and adding a second function for said dependency to said object.

- 5 33. One or more processor readable storage devices according to claim 32, wherein:

 said additional functionality includes code that adds said first function to an object for said first variable and code that provides a pointer to said first function to an object for said changeable item to be called by said object for said changeable item when said
10 changeable item changes.

34. One or more processor readable storage devices according to claim 31, wherein:

 said code includes a marker for said expression, said marker specifies when said
15 expression should be evaluated during execution of said code.

35. One or more processor readable storage devices according to claim 31, wherein:

 said preexisting additional functionality prevents circular evaluation.
20

36. An apparatus that provides for evaluation of expressions, comprising:
 a processor readable storage device; and

 one or more processors in communication with said processor readable storage device, said one or more processors perform a method comprising the steps of:
25 accessing code that includes an expression defining a first variable, said expression is dependent on a changeable item, and
 automatically providing preexisting additional functionality to said code,

said preexisting additional functionality evaluates said expression when said item changes and updates said first variable.

37. An apparatus according to claim 36, wherein:

5 said expression is part of a constraint for said first variable;

 said step of automatically providing includes creating an object for said constraint, adding a first function to said object that sets said first variable, determining dependency of said expression and adding a second function for said dependency to said object; and

10 said additional functionality includes code that adds said first function to an object for said first variable and code that provides a pointer to said first function to an object for said changeable item to be called by said object for said changeable item when said changeable item changes.

15